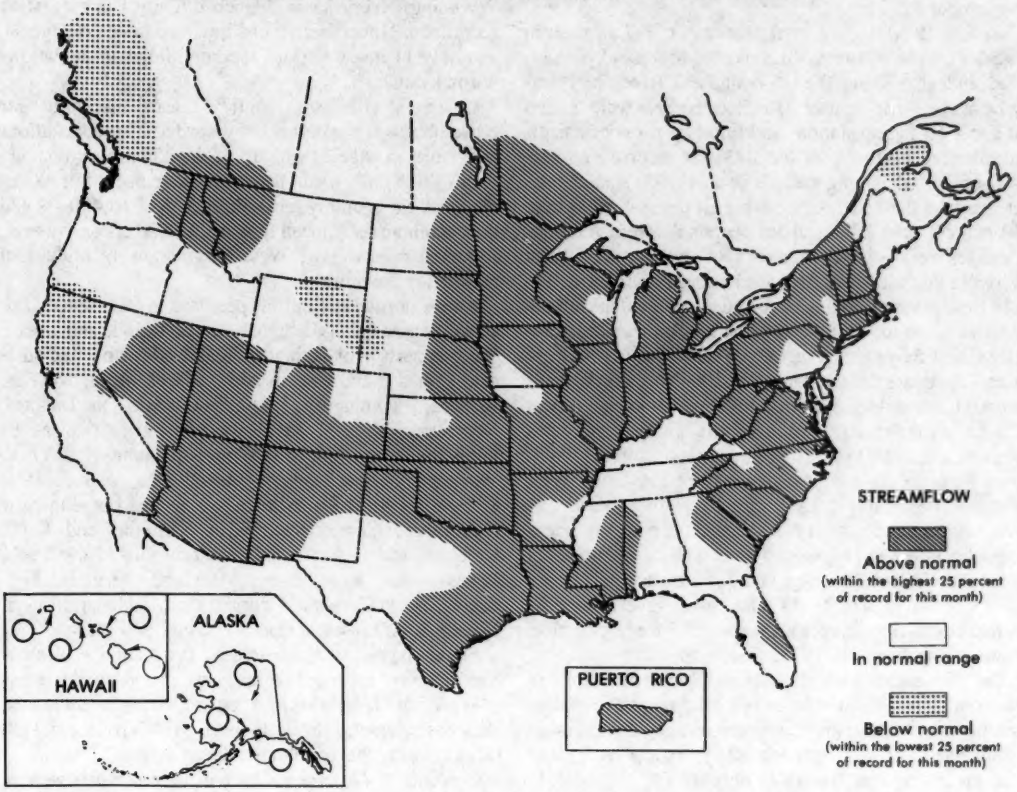
# National Water Conditions

UNITED STATES
Department of the Interior
Geological Survey

CANADA
Department of the Environment
Water Resources Branch

## NOVEMBER 1985

### STREAMFLOW DURING NOVEMBER




Above-average precipitation fell over much of the United States, particularly in the East, where a blocking high-pressure system off the east coast caused unusual amounts of moisture to move northward, resulting in heavy rains from North Carolina to New York November 3–5. The most severe flooding occurred November 3–7 in an 11,000 square-mile area encompassing eastern West Virginia, western Virginia, and the Maryland panhandle. About 40 people were killed, about 50 were missing, damages were estimated at over $600 million, and 8 West Virginia counties were declared Federal disaster areas.

On November 19–20, severe local flooding in Missouri's White River basin killed one person at Potosi and destroyed one gaging station as recurrence intervals exceeded 100 years at 3 of 5 gaging stations in the area.

Streamflow generally decreased in Alaska, Hawaii, Puerto Rico, Florida, southwestern Canada, Wisconsin, and most States between the Mississippi River and the Great Basin; was generally variable in southeastern Canada, Arizona, and Idaho, and increased elsewhere. About 94 percent of the index stations had flows in the normal to above-normal range, up slightly from the 93 percent in those ranges for October. Only 1 index station recorded a November record low, and only 11 index stations recorded flows in the below-normal range. In sharp contrast, monthly mean discharge for November was the highest of record at 25 index stations with 15 of the 25 sites also having record-high daily mean flows for November.

Contents of 77 percent of reporting reservoirs were at or above average for the end of November, including the New York City reservoir system. As a result, New York City lifted all mandatory restrictions on water use November 27.

The combined flow of the 3 largest rivers in the lower 48 States—Mississippi, St. Lawrence, and Columbia—averaged 1,151,000 cfs during November, 43 percent above last month and 75 percent above median.

## STREAMFLOW CONDITIONS DURING OCTOBER 1985

Above average precipitation fell over much of the United States (see Total Precipitation Map on page 6) causing severe floods in some areas. Hurricane Juan dissipated in the Ohio River Valley November 1–2; a blocking high-pressure system off the east coast caused unusual amounts of moisture to move northward resulting in heavy rains from North Carolina to New York November 3–5; and Hurricane Kate moved through Florida, Alabama, Georgia, and South Carolina November 21–22.

Severe flooding occurred November 3–7 in eastern West Virginia, western Virginia, the Maryland panhandle, and also along the Monongahela River in Pennsylvania (see map on page 3) as flood records were broken at about 40 gaging stations and flood magnitudes equalled or exceeded those for the 100-year recurrence interval at about 45 gaging stations in an 11,000 square-mile area across the 4 states (see table on pages 4–5). About 40 people were killed, about 50 people were missing, damages were estimated at over $600 million, and 8 West Virginia counties were declared Federal disaster areas. The most severe flooding occurred along the flanks of the Appalachians in West Virginia and Virginia. For example, Cheat River near Parsons, West Virginia (drainage area 718 square miles), peaked at 200,000 cubic feet per second (cfs), about 3.5 times the 100-year flood, and about 3.8 times the former flood of record. Flood frequencies were less than 100 years at gaging stations on the mainstem Potomac River downstream from Paw Paw, West Virginia, decreasing to 25 years at the gaging station near Washington, D.C., with the 317,000 cfs peak discharge there being the 6th highest of record. Roanoke River at Roanoke, Virginia (drainage area 395 square miles), peaked at a record high of 34,000 cfs causing severe damages in that city as flood stages went about 3.7 feet higher than those of the June 21, 1972, flood.

On November 19–20, severe local flooding in Missouri's White River basin (see map on page 3) killed one person at Potosi and destroyed one gaging station as recurrence intervals exceeded 100 years at 3 of 5 gaing stations in the area (see table on page 6).

Streamflow generally decreased in Alaska, Hawaii, Puerto Rico, Florida, southwestern Canada, Wisconsin, and most States between the Mississippi River and the Great Basin; was generally variable in southeastern Canada, Arizona, and Idaho, and increased elsewhere. About 94 percent of the index stations had flows in the normal to above-normal range, up slightly from the 93 percent in those ranges for October.

Below-normal streamflow persisted only in parts of British Columbia, California, and New Brunswick. Monthly mean flows moved into the below-normal range in parts of Hawaii, British Columbia, California, Arizona, Wyoming, Nebraska, and Quebec. Only 1 index station recorded a November record low (see table on page 7), and only 11 index stations recorded flows in the below-normal range.

In sharp contrast, monthly mean discharge for November was the highest of record at 25 index stations (see table on page 7) with 15 of the 25 sites also having record-high daily mean flows for November. For example, both the monthly mean discharge of 16,400 cfs and the maximum daily mean flow of 110,000 cfs on Potomac River near Paw Paw, West Virginia, were highest of record for November.

Above-normal streamflow persisted in Oklahoma, Lousiana, Minnesota, Michigan, Rhode Island, and Puerto Rico; in parts of Washington, Idaho, Montana, and adjacent Canada; and also in parts of California, Neveda, Arizona, Wyoming, Colorado, New Mexico, the Dakotas, Nebraska, Kansas, Texas, Iowa, Missouri, Arkansas, Illinois, Indiana, Ohio, Mississippi, Alabama, New York, Vermont, Massachusetts, Pennsylvania, and Florida. Streamflow moved into the above normal range in New Hampshire, Connecticut, West Virginia, and South Carolina, and also parts of Massachusetts, New York, Pennsylvania, New Jersey, Maryland, Virginia, Tennessee, North Carolina, Georgia, Ohio, Indiana, Illinois, Missouri, Arkansas, Texas, Arizona, and Nevada.

Flood stages, as designated by the National Weather Service, were exceeded on many rivers and small streams in Washington, Nebraska, Arkansas, and adjacent States, Wisconsin, Iowa, Illinois, Indiana, West Virginia and adjacent States, the Carolinas, Georgia, and Florida.

Contents of 77 percent of reporting reservoirs were at or above average for the end of November, including the New York City reservoir system. As a result, New York City lifted all mandatory restrictions on

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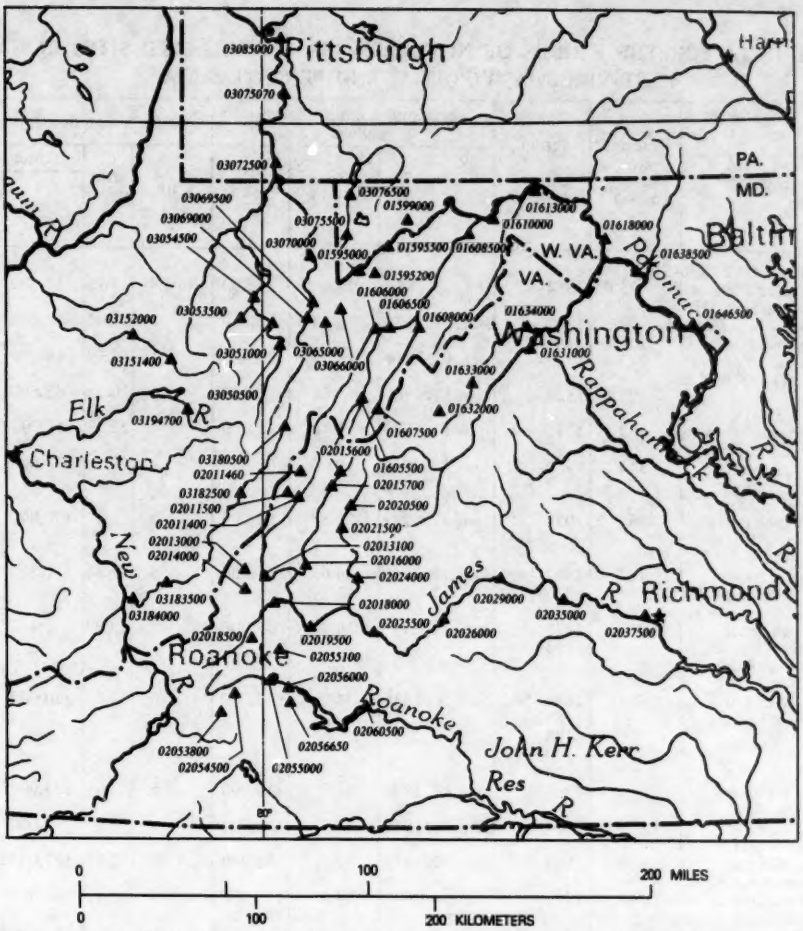
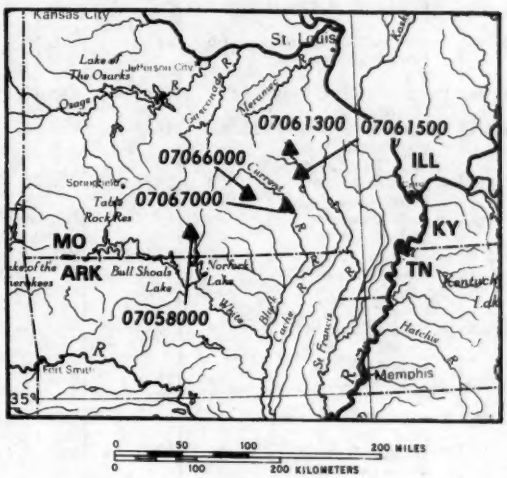



Location of gaging stations in Maryland, West Virginia, Virginia, and Pennsylvania for which flood-frequency data are given.

water use November 27. Significant declines in storage occurred at only 9 percent of reporting sites with over half of these sites in Washington and Idaho.

The combined flow of the 3 largest rivers in the lower 48 states—Mississippi, St Lawrence, and Columbia—averaged 1,151,000 cfs during November, 43 percent above last month and 75 percent above median. Monthly mean flow for all three rivers was in the above-normal range, with flow of the Mississippi River at Vicksburg, Mississippi, at 754,766 cfs, the second highest November flow in 57 years of record, and 235 percent of median. These three large river systems account for runoff from more than half the conterminous United States and provide a useful check on the status of the Nation's surface-water resources.

The hydrographs on page 16 show flow conditions at four sites across the Nation, with three of the four sites in the above-normal flow range for November, typical of flow conditions for the month.




Location of gaging stations in Missouri for which flood-frequency data are given.

## PROVISIONAL DATA FOR THE FLOODS OF NOVEMBER 1985 AT SELECTED SITES IN MARYLAND, WEST VIRGINIA, VIRGINIA, AND PENNSYLVANIA

| WRD station number | Stream and place of determination | Drainage area (square miles) | Period of known floods | Maximum flood previously known | | | Maximum during present flood | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Date | Stage (feet) | Discharge (cfs) | Date | Stage (feet) | Discharge | | Recurrence interval (years) |
| | | | | | | | | | Cfs | Cfs per square mile | |
| | POTOMAC RIVER BASIN | | | | | | | | | | |
| 01595000 | North Branch Potomac River at Steyer, MD. | 73.0 | 1954– | Oct. 15, 1954 | 13.0 | 11,300 | Nov. 4 | 13.13 | 11,500 | 158 | [a]1.3 |
| 01595200 | Stony River near Mount Storm, WV. | 48.8 | 1961– | July 3, 1978 | 10.34 | 5,340 | 5 | 16.41 | 12,000 | 246 | (b) |
| 01595500 | North Branch Potomac River at Kitzmiller, MD. | 225 | 1949– | Oct. 15, 1954 | 13.73 | 33,400 | 4 | 14.77 | 46,000 | 204 | [a]1.6 |
| 01599000 | Georges Creek at Franklin, MD. | 72.4 | 1924– | Mar. 17, 1936 | 9.60 | 8,500 | 4 | 10.78 | 7,600 | 105 | 50 |
| 01605500 | South Branch Potomac River at Franklin, WV. | 182 | 1940–69 1976– | June 17, 1949 | 11.40 | 15,000 | 4 | 22.58 | [c]45,000 | 247 | [a]2.5 |
| 01606000 | North Fork South Branch Potomac River at Cabins, WV. | 314 | 1940– | June 17, 1949 | 18.00 | 50,000 | 4 | (d) | 80,000 | 255 | [a]1.9 |
| 01606500 | South Branch Potomac River near Petersburg, WV. | 642 | 1928– | June 17, 1949 | 22.83 | 62,000 | 5 | (d) | 130,000 | 202 | [a]2.1 |
| 01607500 | South Fork South Branch Potomac River at Brandywine, WV. | 102 | 1943– | June 17, 1949 | 14.6 | 41,200 | 4 | 17.86 | (d) | ... | >100 |
| 01608000 | South Fork South Branch Potomac River near Moorefield, WV. | 283 | 1928–35, 1938– | June 18, 1949 | 16.1 | 39,000 | 5 | 19.99 | (d) | ... | >100 |
| 16085000 | South Branch Potomac River near Springfield, WV. | 1,471 | 1894–96, 1899–1902, 1903–06, 1928– | Mar. 18, 1936 | 34.2 | 143,000 | 6 | 44.22 | 260,000 | 177 | [a]2.0 |
| 01610000 | Potomac River at Paw Paw, WV. | 3,109 | 1936– | Mar. 18, 1936 | 54 | 240,000 | 5 | 53.6 | 235,000 | 75.6 | [a]1.7 |
| 01613000 | Potomac River at Hancock, MD. | 4,073 | 1889– | Mar. 18, 1936 | 47.6 | 340,000 | 6 | 41.2 | 207,000 | 50.8 | 50 |
| 01618000 | Potomac River at Sheperdstown, WV. | 5,936 | 1889– | Mar. 19, 1936 | 42.1 | 335,000 | 6 | 31.46 | 187,000 | 31.5 | 25 |
| 01631000 | South Fork Shenandoah River at Front Royal, VA. | 1,642 | 1870– | Oct. 16, 1942 | 34.8 | 130,000 | 6 | 32.43 | 108,000 | 70.0 | 55 |
| 01632000 | North Fork Shenandoah River at Cootes Store, VA. | 210 | 1836– | Oct. 15, 1942 | 25.3 | 50,000 | (d) | 25.3 | [c]50,000 | 238 | [a]1.2 |
| 01634000 | North Fork Shenandoah River near Strasburg, VA. | 768 | 1836– | Oct. 16, 1942 | 31.2 | 100,000 | 5 | 27.37 | 62,600 | 81.5 | 67 |
| 01638500 | Potomac River at Point of Rocks, MD. | 9,651 | 1889– | Mar. 19, 1936 | 41.03 | 480,000 | 7 | 36.28 | 309,000 | 32.0 | 25 |
| 01646500 | Potomac River near Washington, D.C. | 11,560 | 1889– | Mar. 19, 1936 | 28.1 | 484,000 | 7 | 18.00 | 317,000 | 27.4 | 25 |
| | JAMES RIVER BASIN | | | | | | | | | | |
| 02011400 | Jackson River near Bacova, VA. | 158 | 1972– | Dec. 26, 1973 | 13.88 | 7,560 | 4 | 22.25 | (d) | ... | >100 |
| 02011460 | Back Creek near Sunrise, VA. | 56.7 | 1974– | Jan. 26, 1978 | 6.80 | 5,400 | 4 | 9.95 | (d) | ... | >100 |
| 02011500 | Back Creek near Mountain Grove, VA. | 134 | 1951– | Mar. 7, 1967 | 10.77 | 12,700 | 4 | 11.24 | (d) | ... | (d) |
| 02013000 | Dunlap Creek near Covington, VA. | 164 | 1928– | June 21, 1972 | 15.65 | 27,400 | 4 | 13.42 | 17,400 | 106 | 100 |
| 02013100 | Jackson River below Dunlap Creek, at Covington, VA. | 614 | 1972– | June 21, 1972 | 24.36 | [c]34,000 | 4 | 23.31 | (d) | ... | (d) |
| 02014000 | Potts Creek near Covington, VA. | 153 153 | 1928– 1928– | June 21, 1972 | 12.33 | 12,400 | 4 | 13.57 | (d) | ... | >100 |
| 02015600 | Cowpasture River near Head Waters, VA. | 11.3 | 1949– | June 17, 1947 | 6.5 | 5,650 | 4 | 6.45 | (d) | ... | >100 |
| 02015700 | Bullpasture River at Williamsville, VA. | 110 | 1960– | Apr. 5, 1977 | ... | 9,430 | 4 | 14.4 | (d) | ... | >100 |
| 02016000 | Cowpasture River near Clifton Forge, VA. | 461 | 1913– | Mar. 1913 | 20.8 | 45,000 | 5 | 19.21 | (d) | ... | >100 |

See footnotes at end of table.

## PROVISIONAL DATA FOR THE FLOODS OF NOVEMBER 1985 AT SELECTED SITES IN MARYLAND, WEST VIRGINIA, VIRGINIA, AND PENNSYLVANIA—Continued

| WRD station number | Stream and place of determination | Drainage area (square miles) | Period of known floods | Maximum flood previously known | | | Maximum during present flood | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Date | Stage (feet) | Discharge (cfs) | Date | Stage (feet) | Discharge | | Recurrence interval (years) |
| | | | | | | | | | Cfs | Cfs per square mile | |
| | JAMES RIVER BASIN—Continued | | | | | | | | | | |
| 02018000 | Craig Creek at Parr, VA. | 329 | 1925– | June 21, 1972 | 19.29 | 20,200 | 4 | 24.76 | (d) | ... | >100 |
| 02018500 | Catawba Creek near near Catawba, VA. | 34.3 | 1943– | June 21, 1972 | 10.35 | 7,740 | 4 | 19.10 | (d) | ... | >100 |
| 02019500 | James River at Buchanan, VA. | 2,075 | 1870– | Nov. 1877 | 34.9 | [c]142,000 | 6 | 38.84 | [c]175,000 | 84.3 | 1.5 |
| 02020500 | Calfpasture River above Mill Creek at Goshen, VA. | 144 | 1938– | Oct. 6, 1972 | 12.78 | 20,900 | 4 | 20.23 | (d) | ... | >100 |
| 02021500 | Maury River at Rockbridge Baths, VA. | 329 | 1928– | Mar. 17, 1936 | 13.07 | 33,000 | 5 | 19.19 | 87,700 | 267 | 2.4 |
| 02024000 | Maury River near Buena Vista, VA. | 646 | 1936– | Aug. 20, 1969 | 31.23 | 105,000 | 5 | 26.42 | 72,800 | 113 | [a]1.5 |
| 02025500 | James River at Holcombs Rock, VA. | 3,259 | 1913– | Aug. 20, 1969 | 35.50 | 150,000 | 5 | 42.32 | [c]208,000 | 63.8 | [a]1.6 |
| 02026000 | James River at Bent Bent Creek, VA. | 3,683 | 1924– | June 21, 1972 | 27.13 | 176,000 | (d) | 32.0 | 245,000 | 66.5 | [a]1.8 |
| 02029000 | James River at Scottsville, VA. | 4,584 | 1870– | June 22, 1972 | 34.02 | 301,000 | 6 | 33.16 | 277,000 | 60.4 | [a]1.3 |
| 02035000 | James River at Cartersville, VA. | 6,257 | 1898– | June 22, 1972 | 37.87 | 362,000 | 6 | 32.60 | 225,000 | 40.0 | 56 |
| 02037500 | James River near Richmond, VA. | 6,758 | 1934– | June 23, 1972 | 28.62 | 313,000 | 7 | 24.82 | 219,000 | 32.4 | 31 |
| | ROANOKE RIVER BASIN | | | | | | | | | | |
| 02053800 | South Fork Roanoke River near Shawsville, VA. | 110 | 1959– | June 21, 1972 | 11.12 | 14,200 | 4 | 8.88 | 7,250 | 65.9 | 43 |
| 02054500 | Roanoke River at Lafayette, VA. | 257 | 1940– | June 21, 1972 | 15.60 | 24,500 | 4 | 13.41 | 17,300 | 67.3 | 38 |
| 02055000 | Roanoke River at Roanoke, VA. | 395 | 1899– | June 21, 1972 | 19.61 | 25,300 | 4 | 23.35 | [c]34,000 | 86.0 | [a]1.3 |
| 02055100 | Tinker Creek near Dalesville, VA. | 11.7 | 1940– | June 21, 1972 | 9.82 | 4,000 | 4 | 13.36 | (d) | ... | >100 |
| 02056000 | Roanoke River at Niagara, VA. | 512 | 1926– | Apr. 27, 1978 | 19.12 | 29,300 | 4 | 25.30 | (d) | ... | >100 |
| 02056650 | Back Creek near Dundee, VA. | 56.8 | 1971– | June 21, 1972<br>May 29, 1976 | 20.0<br>15.00 | (d)<br>7,500 | (d) | [c]24.2 | (d) | ... | >100 |
| 02060500 | Roanoke (Staunton) River at Altavista, VA. | 1,789 | 1930– | Aug. 15, 1940 | 40.08 | 105,000 | 5 | 27.42 | 39,200 | 21.9 | 4 |
| | MONONGAHELA RIVER BASIN | | | | | | | | | | |
| 03050500 | Tygart Valley River near Elkins, WV. | 272 | 1944– | Dec. 31, 1969 | 15.65 | 13,100 | 5 | 22.81 | (d) | ... | >100 |
| 03051000 | Tygart Valley River at Bellington, WV. | 408 | 1888– | July 1888 | [e]21.7 | 21,200 | 5 | 23.65 | 29,500 | 72.3 | [a]1.5 |
| 03053500 | Buckhannon River at Hall, WV. | 277 | 1907–09, 1915– | Mar. 7, 1967 | 15.07 | 13,000 | 5 | 16.88 | [c]14,500 | 52.3 | [c]100 |
| 03054500 | Tygart Valley River at Phillipi, WV. | 916 | 1912– | Mar. 7, 1967 | 25.93 | 43,000 | 6 | 31.83 | 56,000 | 61.1 | 1.3 |
| 03065000 | Dry Fork at Hendricks, WV. | 345 | 1940– | Oct. 15, 1954 | 15.23 | 47,000 | 5 | 20.74 | (d) | ... | >100 |
| 03066000 | Blackwater River at Davis, WV. | 86.2 | 1921– | Mar. 29, 1924 | 13.20 | 7,170 | 5 | 17.67 | 12,500 | 145 | [a]1.7 |
| 03069000 | Shavers Fork at Parsons, WV. | 214 | 1888– | July 10, 1888<br>July 17, 1907 | [e]12.5<br>[e]12.5 | 25,000<br>25,000 | 5 | 19.86 | (d) | ... | >100 |
| 03069500 | Cheat River near Parsons, WV. | 718 | 1888– | Oct. 15, 1954 | 19.08 | 52,100 | 5 | 23.8 | 200,000 | 279 | [a]3.5 |
| 03070000 | Cheat River at Rowlesburg, WV. | 972 | 1844– | July 6, 1844<br>July 1888 | 16.7<br>36.0 | 89,000<br>(d) | 5 | 21.0 | 230,000 | 237 | [a]2.6 |
| 03072500 | Monongahela River at Greensboro, PA. | 4,407 | 1938– | Mar. 7, 1967 | 29.61 | 134,000 | 5 | 39.39 | 180,000 | 40.8 | [a]1.1 |
| 03075070 | Monongahela River at Elizabeth, PA. | 5,340 | 1933– | Mar. 7, 1967 | 20.60 | 158,000 | 5 | 23.6 | 178,000 | 33.3 | 50 |
| 03075500 | Youghiogheny River near Oakland, MD. | 134 | 1936– | Oct. 16, 1954 | 12.16 | 11,800 | 5 | 12.08 | 11,700 | 87.3 | 50 |
| 03076500 | Youghiogheny River near Friendsville, Md. | 295 | 1898– | Mar. 29, 1924 | 14.2 | 15,600 | 5 | 8.39 | 11,000 | 37.3 | 10 |

See footnotes at end of table.

**PROVISIONAL DATA FOR THE FLOODS OF NOVEMBER 1985 AT SELECTED SITES IN MARYLAND, WEST VIRGINIA, VIRGINIA, AND PENNSYLVANIA—Continued**

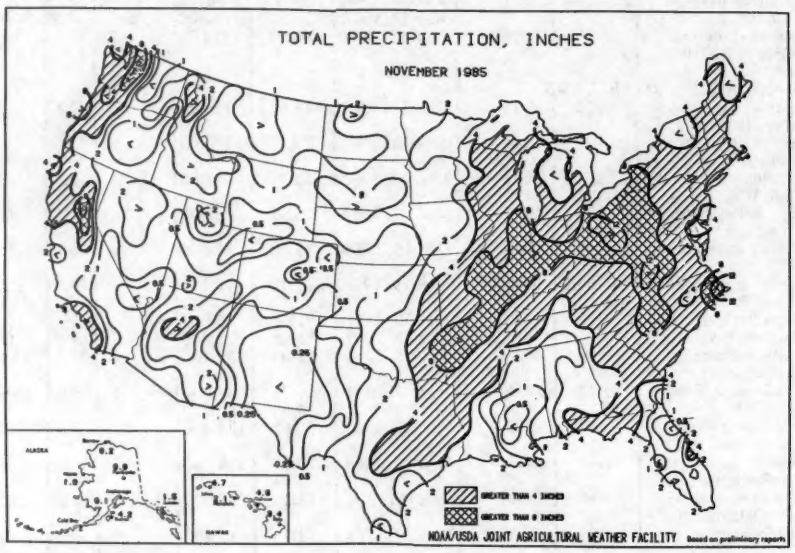
| WRD station number | Stream and place of determination | Drainage area (square miles) | Period of known floods | Maximum flood previously known | | | Maximum during present flood | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Date | Stage (feet) | Discharge (cfs) | Date | Stage (feet) | Discharge | | Recurrence interval (years) |
| | | | | | | | | | Cfs | Cfs per square mile | |
| | **MONONGAHELA RIVER BASIN—Continued** | | | | | | | | | | |
| 03085000 | Monongahela River at Braddock, PA. | 7,337 | 1938– | June 5, 1941 | 31.20 | 201,000 | Nov. 5 | 29.77 | 190,000 | 25.9 | 25 |
| | **BEAVER RIVER BASIN** | | | | | | | | | | |
| 03102850 | Shenango River near Transfer, PA. | 337 | 1965– | Feb. 17, 1976 | 10.09 | 5,200 | 5 | 10.47 | 5,400 | 16.0 | (d) |
| | **LITTLE KANAWHA RIVER BASIN** | | | | | | | | | | |
| 03151400 | Little Kanawha River near Wildcat, WV. | 112 | 1973– | Jan. 26, 1978 | 12.62 | 7,090 | 5 | 14.81 | 10,500 | 93.8 | [c]50 |
| 03152000 | Little Kanawha River at Glenville, WV. | 386 | 1915– | Mar. 7, 1967 | [f]34.50 | 21,500 | 5 | 36.50 | 27,000 | 69.9 | (b) |
| | **KANAWHA RIVER BASIN** | | | | | | | | | | |
| 03180500 | Greenbrier River at Durbin, WV. | 133 | 1943– | Mar. 7, 1967 | 9.15 | 12,200 | 4 | 15.82 | (d) | ... | >100 |
| 03182500 | Greenbrier River at Buckeye, WV. | 540 | 1929– | Feb. 5, 1932 | 17.5 | 41,500 | 5 | 23.2 | (d) | ... | >100 |
| 03183500 | Greenbrier River at Alderson, WV. | 1,364 | 1895– | Mar. 4, 1918<br>Mar. 18, 1936 | 22.0<br>21.85 | 77,500<br>60,800 | 5 | 23.95 | (d) | ... | >100 |
| 03184000 | Greenbrier River at Hilldale, WV. | 1,619 | 1936– | Dec. 27, 1973 | 23.13 | 58,100 | 6 | 25.55 | (d) | ... | >100 |
| 03194700 | Elk River below Webster Springs, WV. | 266 | 1861, 1896, 1959– | Sept. 1861<br>June 2, 1974 | [g]26.34<br>13.97 | (d)<br>23,900 | 4 | 17.20 | 38,000 | 143 | [a]1.3 |

[a] Approximate ratio of discharge to that of 100-year flood.
[b] Regulated site.
[c] About.
[d] Not determined.
[f] At site and datum of former gage.
[g] Backwater.
[h] At site 0.2 mile upstream.

Provisional data; subject to revision

**STAGES AND DISCHARGES FOR THE FLOOD OF NOVEMBER 1985 AT SELECTED SITES IN SOUTHEASTERN MISSOURI**

| WRD station number | Stream and place of determination | Drainage area (square miles) | Period of known floods | Maximum flood previously known | | | Maximum during present flood | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Date | Stage (feet) | Discharge (cfs) | Date | Stage (feet) | Discharge | | Recurrence interval (years) |
| | | | | | | | | | Cfs | Cfs per square mile | |
| | **WHITE RIVER BASIN** | | | | | | | | | | |
| 07058000 | Bryant Creek near Tecumseh. | 570 | 1944– | Dec. 3, 1982 | 26.74 | 71,100 | Nov. 19 | 24.8 | 56,000 | 98.2 | >100 |
| 07061300 | East Fork Black River at Lesterville. | 94.5 | 1960– | Nov. 3, 1972 | 11.13 | 10,400 | 19 | 12.53 | 15,000 | 159 | 100 |
| 07061500 | Black River near Annapolis. | 484 | 1939– | Nov. 2, 1972 | 21.55 | 49,700 | 19 | 25.81 | 100,000 | 207 | >100 |
| 07066000 | Jacks Fork at Eminence. | 398 | 1921– | Apr. 30, 1983 | 17.03 | 40,200 | 19 | 17.6 | 56,000 | 141 | >100 |
| 07067000 | Current River at Van Buren. | 1,667 | 1912– | Aug. 21, 1915 | 25.9 | 125,000 | 20 | 26.53 | 88,000 | 52.7 | 25 |




(From Weekly Weather and Crop Bulletin published by National Weather Service and Department of Agriculture.)

Provisional data; subject to revision

## NEW EXTREMES DURING NOVEMBER 1985 AT STREAMFLOW INDEX STATIONS

| Station number | Stream and place of determination | Drainage area (square miles) | Years of record | Previous November extremes (period of record) | | November 1985 | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | Monthly mean in cfs (year) | Daily mean in cfs (year) | Monthly mean in cfs | Percent of median | Daily mean in cfs | Day |
| | | | | HIGH FLOWS | | | | | |
| 01610000 | Potomac River at Paw Paw, West Virginia. | 3,109 | 47 | 6,287 (1971) | 17,700 (1976) | 16,400 | 1,262 | 110,000 | 6 |
| 01646500 | Potomac River near Washington, D.C. | 11,560 | 55 | 21,340 (1932) | 129,000 (1952) | 42,670 | 959 | 293,000 | 7 |
| 01667500 | Rapidan River near Culpeper, Virginia. | 472 | 55 | 1,567 (1972) | 7,530 (1947) | 2,520 | 821 | 22,600 | 5 |
| 02030500 | Slate River near Arvonia, Virginia. | 226 | 59 | 686 (1972) | 3,700 (1934) | 880 | 657 | 5,960 | 5 |
| 02045500 | Nottaway River near Stony Creek, Virginia. | 579 | 56 | 1,693 (1979) | 6,520 (1979) | 2,820 | 1,076 | 14,300 | 6 |
| 02102000 | Deep River at Moncure, North Carolina. | 1,434 | 55 | 4,558 (1948) | 19,100 (1948) | 4,790 | 1,254 | 22,400 | 22 |
| 03020500 | Oil Creek At Rouseville, Pennsylvania. | 300 | 76 | 1,343 (1970) | 4,350 (1970) | 1,559 | 358 | 5,340 | 27 |
| 03049500 | Allegheny River at Natrona, Pennsylvania. | 11,410 | 47 | 37,740 (1970) | 84,200 (1950) | 44,600 | 326 | ..... | ... |
| 03079000 | Casselman River at Markleton, Pennsylvania. | 382 | 65 | 1,124 (1921) | 7,160 (1921) | 2,974 | 1,015 | ..... | ... |
| 03085000 | Monongahela River at Braddock, Pennsylvania. | 7,337 | 47 | 19,740 (1945) | 49,500 (1950) | 37,100 | 480 | ..... | ... |
| 03106000 | Connoquenessing Creek near Zelienople, Pennsylvania. | 356 | 66 | 1,376 (1921) | 8,560 (1927) | 1,630 | 921 | ..... | ... |
| 03109500 | Little Beaver Creek near East Liverpool, Ohio. | 496 | 70 | 1,164 (1926) | 6,620 (1929) | 1,902 | 942 | 5,870 | 16 |
| 03183500 | Greenbrier River at Alderson, West Virginia. | 1,357 | 90 | 4,928 (1972) | 56,800 (1900) | 5,316 | 479 | 48,600 | 5 |
| 03294500 | Ohio River at Louisville, Kentucky. | 91,170 | 57 | 187,600 (1972) | 421,000 (1973) | 205,500 | 329 | 330,400 | 17 |
| 03373500 | East Fork White River at Shoals, Indiana. | 4,927 | 71 | 12,040 (1925) | 31,900 (1979) | 12,563 | 845 | 24,810 | 21 |
| 03377500 | Wabash River at Mount Carmel, Illinois. | 28,635 | 58 | 56,210 (1972) | 75,700 (1972) | 61,470 | 556 | 137,400 | 29 |
| 03380500 | Skillet Fork at Wayne City, Illinois. | 464 | 70 | 1,526 (1919) | 7,300 (1973) | 2,990 | 5,427 | 24,000 | 20 |
| 04040500 | Sturgeon River near Sidnaw, Michigan. | 171 | 45 | 414 (1982) | 1,030 (1979) | 446 | 242 | 1,190 | 3 |
| 04071000 | Oconto River near Gillett, Wisconsin. | 678 | 74 | 1,189 (1919) | 2,950 (1919) | 1,767 | 317 | 2,700 | (*) |
| 04121500 | Muskegon River at Evart, Michigan. | 1,450 | 53 | 1,691 (1951) | 3,000 (1951) | 2,071 | 253 | 3,500 | 20 |
| 05407000 | Wisconsin River at Muscoda, Wisconsin. | 10,300 | 72 | 15,840 (1982) | 33,600 (1982) | 17,214 | 262 | 29,600 | 8 |
| 05446500 | Rock River near Joslin, Illinois. | 9,542 | 46 | 14,580 (1961) | 20,700 (1961) | 16,700 | 441 | 22,300 | 22 |
| 05572000 | Sangamon River at Monticello, Illinois. | 550 | 75 | 1,316 (1941) | 5,000 (1921) | 2,820 | 6,746 | 9,600 | 21 |
| 06934500 | Missouri River at Hermann, Missouri. | 524,200 | 88 | 144,300 (1961) | 308,000 (1928) | 151,766 | 278 | 320,000 | 20 |
| 12358500 | Middle Fork Flathead River near West Glacier, Montana. | 1,128 | 46 | 2,191 (1950) | 4,660 (1959) | 3,230 | 399 | 7,540 | 5 |
| | | | | LOW FLOWS | | | | | |
| 08EF001 | Skeena River at Usk, British Columbia, Canada. | 16,300 | 43 | 7,804 (1928) | 4,202 (1970) | 6,568 | 34 | 3,145 | 30 |

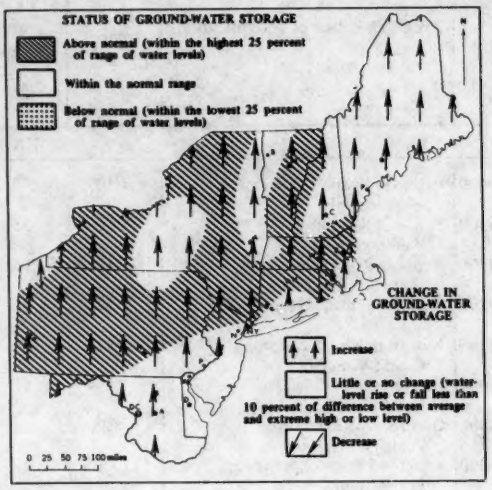
*Occurred more than once.

## GROUND-WATER CONDITIONS DURING NOVEMBER 1985

Ground-water levels rose in nearly the entire northeastern region, responding both to recharge from above-average precipitation and to normal seasonal conditions of reduced rates of evapotranspiration. (See map.) Levels continued to decline, at least slightly, in some wells in southeastern Massachusetts, in southern New Jersey, in Delaware, and the on eastern shore of Maryland. Levels near the end of the month were above average for November in many parts of the region, including large areas in New York, Pennsylvania, and central New England. Below-average levels persisted in scattered parts of Delaware, eastern Maryland,and southern New Jersey.

In the southeastern States, ground-water levels rose in Virginia and Lousiana; trends were mixed in other southeastern States. Water levels were above average in Kentucky, Virginia, and North Carolina. Levels were mixed with respect to average in West Virginia, Arkansas, and Louisiana. New high ground-water levels for November were reached in West Virginia and Georgia, and a new November low level was recorded in the key well near Memphis, Tennessee.

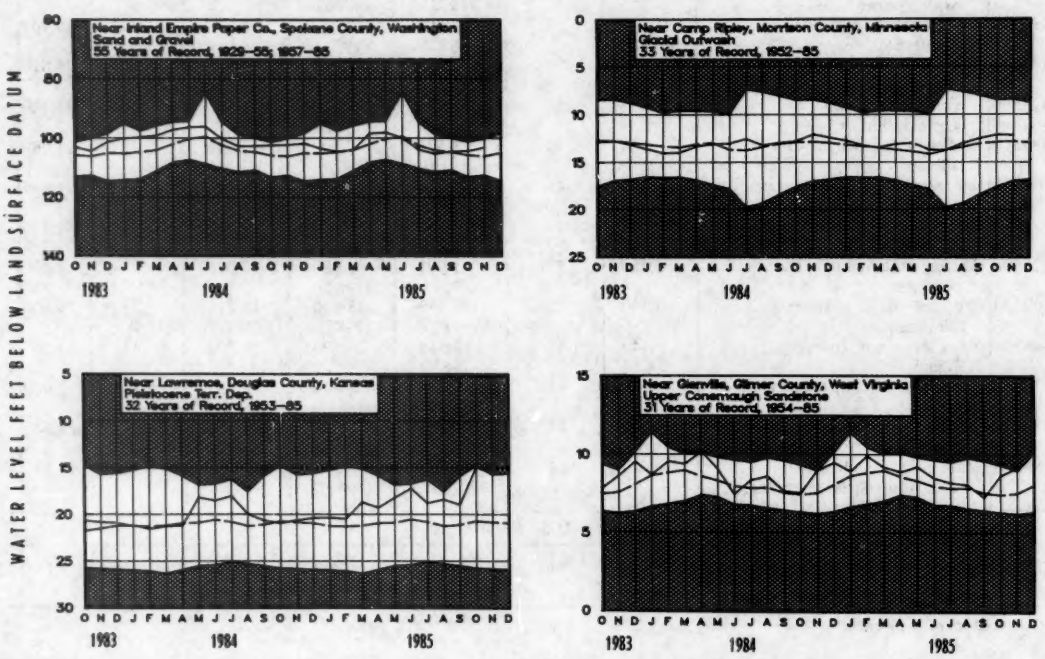
In the central and western Great Lakes States, ground-water levels rose in Indiana and Ohio. Trends were mixed in Minnesota, Michigan, and Iowa. Water levels were above average in Michigan, Indiana, and Ohio, mostly above average in Minnesota, and mixed with respect to average in Iowa. New high ground-water


STATUS OF GROUND-WATER STORAGE
Above normal (within the highest 25 percent of range of water levels)
Within the normal range
Below normal (within the lowest 25 percent of range of water levels)
N
CHANGE IN GROUND-WATER STORAGE
Increase
Little or no change (water-level rise or fall less than 10 percent of difference between average and extreme high or low level)
Decrease
0 25 50 75 100 miles

Map shows ground-water storage near end of November and change in ground-water from end of October to end of November.

## MONTH-END GROUND-WATER LEVELS IN KEY WELLS

Unshaded area indicates range between highest and lowest record for the month. Dashed line indicates average of monthly levels in previous years. Heavy line indicates level for current period.


WATER LEVEL FEET BELOW LAND SURFACE DATUM
Near Inland Empire Paper Co., Spokane County, Washington
Sand and Gravel
55 Years of Record, 1929–85; 1957–85
Near Camp Ripley, Morrison County, Minnesota
Glacial Outwash
33 Years of Record, 1952–85
Near Lawrence, Douglas County, Kansas
Pleistocene Terr. Dep.
32 Years of Record, 1953–85
Near Glenville, Gilmer County, West Virginia
Upper Conemaugh Sandstone
31 Years of Record, 1954–85
O N D J F M A M J J A S O N D J F M A M J J A S O N D
1983
1984
1985

levels were reached in key wells in Michigan, Ohio, and Iowa.

In the western States, ground-water levels rose in Washington and Nevada, and declined in North Dakota. Water-level trends were mixed in Idaho, Nebraska, southern California, Utah, Kansas, New Mexico, and Texas. New high ground-water levels for November were reached in Nevada, Utah, and New Mexico. Despite a net decline during the month, a new November high level was recorded in the Douglas County key well in Kansas. A new November low level was reached in the Dayton well in New Mexico. Despite net rises in level during the month, new November low levels were recorded also in the Las Vegas Valley well in Nevada and in the key well near El Paso in Texas.

**Provisional data; subject to revision**

## WATER LEVELS IN KEY OBSERVATION WELLS IN SOME REPRESENTATIVE AQUIFERS IN THE CONTERMINOUS UNITED STATES—NOVEMBER 1985

| Aquifer and location | Water level in feet with reference to land-surface datum | Departure from average in feet | Net change in water level in feet since: | | Year records began | Remarks |
|---|---|---|---|---|---|---|
| | | | Last month | Last year | | |
| Glacial drift at Hanska, south-central Minnesota | –5.22 | +3.19 | –1.22 | +1.99 | 1942 | |
| Glacial drift at Roscommon in north-central part of Lower Peninsula, Michigan | –4.04 | +0.85 | –0.05 | +0.33 | 1935 | |
| Glacial drift at Marion, Iowa | –3.21 | +3.38 | +1.18 | +1.03 | 1941 | |
| Glacial drift at Princeton in northwestern Illinois | –6.20 | +6.00 | +6.00 | +3.54 | 1943 | |
| Petersburg Granite, southeastern Piedmont near Fall Zone, Colonial Heights, Virginia | –13.79 | +2.51 | +1.98 | +3.86 | 1939 | |
| Glacial outwash sand and gravel, Louisville, Kentucky (U.S. well no. 2) | –17.04 | +8.49 | –0.11 | +0.05 | 1946 | |
| 500-foot sand aquifer near Memphis, Tennessee (U.S. well no. 2) | –104.47 | –15.18 | +0.01 | –0.49 | 1941 | November low. |
| Granite in eastern Piedmont Province, Chapel Hill, North Carolina (U.S. well no. 5) | –42.82 | +0.58 | +0.40 | –2.97 | 1931 | |
| Sparta Sand in Pine Bluff industrial area, Arkansas | –215.70 | –10.56 | +1.95 | +12.20 | 1958 | |
| Eutaw Formation in the City of Montgomery, Alabama (U.S. well no. 4) | –21.8 | +1.1 | –0.1 | –1.0 | 1952 | |
| Limestone aquifer on Cockspur Island, Savannah area, Georgia (U.S. well no. 6) | –34.22 | +7.40 | +0.09 | +1.20 | 1956 | November high. |
| Sand and gravel in Puget Trough, Tacoma, Washington | –102.70 | +7.18 | +0.28 | –1.82 | 1952 | |
| Pleistocene glacial outwash gravel, North Pole, northern Idaho (U.S. well no. 3) | –459.6 | +0.7 | –0.7 | –5.0 | 1929 | |
| Snake River Group: Snake River Plain Aquifer, at Idaho (U.S. well no. 4) | –583.3 | +1.0 | +0.2 | –1.1 | 1949 | |
| Alluvial valley fill in Flowell area, Millard County, Utah (U.S. well no. 9) | –4.82 | +24.42 | +0.68 | –4.82 | 1929 | |
| Alluvial sand and gravel, Platte River Valley, Ashland, Nebraska (U.S. well no. 6) | –5.80 | +0.49 | –0.10 | –1.00 | 1935 | |
| Alluvial valley fill in Steptoe Valley, Nevada | –8.15 | +4.98 | +0.29 | +0.43 | 1950 | November high. |
| Pleistocene terrace deposits in Kansas River valley, at Lawrence, northeastern Kansas | –15.66 | +5.25 | –0.75 | +4.94 | 1953 | November high. |
| Alluvium and Paso Robles clay, sand, and gravel, Santa Maria Valley, California | –127.31 | +16.65 | –12.74 | –30.34 | 1957 | |
| Valley fill, Elfrida area, Douglas, Arizona (U.S. well no. 15) | –105.00 | –24.96 | 0 | +1.80 | 1951 | |
| Hueco bolson, El Paso area, Texas | –264.44 | –18.19 | +0.60 | –1.54 | 1965 | November low. |
| Evangeline aquifer, Houston area, Texas | –315.18 | –11.69 | +5.40 | –3.65 | 1965 | |

Provisional data; subject to revision

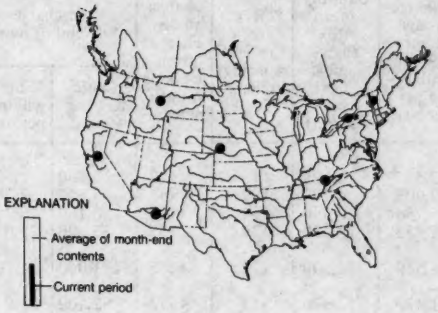
# USABLE CONTENTS OF SELECTED RESERVOIRS NEAR END OF NOVEMBER 1985

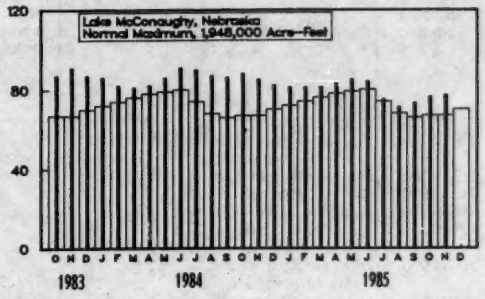
[Contents are expressed in percent of reservoir capacity. The usable storage capacity of each reservoir is shown in the column headed "Normal maximum."]

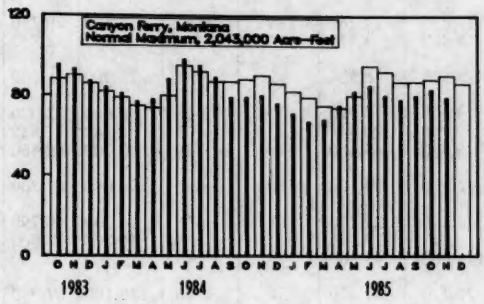
| Reservoir<br>Principal uses:<br>F–Flood control<br>I–Irrigation<br>M–Municipal<br>P–Power<br>R–Recreation<br>W–Industrial | Percent of normal maximum: End of Nov. 1985 | End of Nov. 1984 | Average for end of Nov. | End of Oct. 1985 | Normal maximum[a] (acre-feet) |
|---|---|---|---|---|---|
| **NOVA SCOTIA** | | | | | |
| Rossignol, Mulgrave, Falls Lake, St. Margaret's Bay, Black, and Ponhook Reservoirs(P) | 22 | 23 | 40 | 17 | [b]226,300 |
| **QUEBEC** | | | | | |
| Allard (P) | 89 | 75 | 62 | 81 | 280,600 |
| Gouin (P) | 78 | 79 | 69 | 80 | 6,954,000 |
| **MAINE** | | | | | |
| Seven reservoir systems (MP) | 56 | 43 | 57 | 47 | 4,098,000 |
| **NEW HAMPSHIRE** | | | | | |
| First Connecticut Lake (P) | 60 | 62 | 74 | 64 | 76,450 |
| Lake Francis (FPR) | 88 | 61 | 78 | 78 | 99,310 |
| Lake Winnipesaukee (PR) | 65 | 53 | 59 | 54 | 165,700 |
| **VERMONT** | | | | | |
| Harriman (P) | 86 | 70 | 64 | 78 | 116,200 |
| Somerset (P) | 85 | 78 | 70 | 73 | 57,390 |
| **MASSACHUSETTS** | | | | | |
| Cobble Mountain and Borden Brook (MP) | 73 | 63 | 72 | 65 | 77,920 |
| **NEW YORK** | | | | | |
| Great Sacandaga Lake (FPR) | 73 | 48 | 56 | 65 | 786,700 |
| Indian Lake (FMP) | 94 | 64 | 60 | 92 | 103,300 |
| New York City reservoir system (MW) | 65 | 52 | 65 | 52 | 1,680,000 |
| **NEW JERSEY** | | | | | |
| Wanaque (M) | 93 | 61 | 65 | 80 | 85,100 |
| **PENNSYLVANIA** | | | | | |
| Allegheny (FPR) | 50 | 32 | 34 | 29 | 1,180,000 |
| Pymatuning (FMR) | 104 | 91 | 80 | 87 | 188,000 |
| Raystown Lake (FR) | 68 | 66 | 52 | 65 | 761,900 |
| Lake Wallenpaupack (PR) | 75 | 48 | 52 | 70 | 157,800 |
| **MARYLAND** | | | | | |
| Baltimore municipal system (M) | 72 | 93 | 84 | 72 | 261,900 |
| **NORTH CAROLINA** | | | | | |
| Bridgewater (Lake James) (P) | 94 | 91 | 77 | 91 | 288,800 |
| Narrows (Badin Lake) (P) | 97 | 86 | 92 | 90 | 128,900 |
| High Rock Lake (P) | 83 | 32 | 54 | 64 | 234,800 |
| **SOUTH CAROLINA** | | | | | |
| Lake Murray (P) | 82 | 78 | 60 | 86 | 1,614,000 |
| Lakes Marion and Moultrie (P) | 86 | 74 | 64 | 80 | 1,862,000 |
| **SOUTH CAROLINA–GEORGIA** | | | | | |
| Clark Hill (FP) | 65 | 50 | 51 | 64 | 1,730,000 |
| **GEORGIA** | | | | | |
| Burton (PR) | 91 | 82 | 58 | 96 | 104,000 |
| Sinclair (MPR) | 90 | 67 | 73 | 87 | 214,000 |
| Lake Sidney Lanier (FMPR) | 51 | 53 | 50 | 48 | 1,686,000 |
| **ALABAMA** | | | | | |
| Lake Martin (P) | 78 | 79 | 61 | 87 | 1,375,000 |
| **TENNESSEE VALLEY** | | | | | |
| Clinch Projects: Norris and Melton Hill Lakes (FPR) | 28 | 33 | 31 | 27 | 2,229,300 |
| Douglas Lake (FPR) | 27 | 20 | 18 | 18 | 1,394,000 |
| Hiwassee Projects: Chatuge, Nottely, Hiwassee, Apalachia, Blue Ridge, Ocoee 3, and Parksville Lakes (FPR) | 50 | 54 | 42 | 53 | 1,012,000 |
| Holston Projects: South Holston, Watauga, Boone, Fort Patrick Henry, and Cherokee Lakes (FPR) | 44 | 41 | 35 | 42 | 2,880,000 |
| Little Tennessee Projects: Nantahala, Thorpe, Fontana, and Chilhowee Lakes (FPR) | 26 | 42 | 41 | 29 | 1,478,000 |
| **WISCONSIN** | | | | | |
| Chippewa and Flambeau (PR) | 85 | 80 | 76 | 92 | 365,000 |
| Wisconsin River (21 reservoirs) (PR) | 92 | 78 | 66 | 92 | 399,000 |
| **MINNESOTA** | | | | | |
| Mississippi River headwater system (FMR) | 30 | 26 | 27 | 32 | 1,640,000 |
| **NORTH DAKOTA** | | | | | |
| Lake Sakakawea (Garrison) (FIPR) | 80 | 88 | 87 | 82 | 22,700,000 |
| **SOUTH DAKOTA** | | | | | |
| Angostura (I) | 48 | 69 | 73 | 47 | 127,600 |
| Belle Fourche (I) | 18 | 53 | 40 | 12 | 185,200 |
| Lake Francis Case (FIP) | 56 | 48 | 50 | 59 | 4,834,000 |
| Lake Oahe (FIP) | 74 | 83 | ..... | 76 | 22,530,000 |
| Lake Sharpe (FIP) | 100 | 99 | 95 | 100 | 1,725,000 |
| Lewis and Clarke Lake (FIP) | 92 | 91 | 92 | 94 | 477,000 |
| **NEBRASKA** | | | | | |
| Lake McConaughy (IP) | 77 | 85 | 68 | 76 | 1,948,000 |
| **OKLAHOMA** | | | | | |
| Eufaula (FRP) | 104 | 102 | 90 | 109 | 2,378,000 |
| Keystone (FPR) | 137 | 73 | 96 | 98 | 661,000 |
| Tenkiller Ferry (FPR) | 113 | 110 | 99 | 110 | 628,200 |
| Lake Altus (FIMR) | 16 | 7 | 44 | 14 | 133,000 |
| Lake O'The Cherokees (FPR) | 122 | 92 | 82 | 106 | 1,492,000 |
| **OKLAHOMA–TEXAS** | | | | | |
| Lake Texoma (FMPRW) | 95 | 91 | 92 | 102 | 2,722,000 |
| **TEXAS** | | | | | |
| Bridgeport (IMW) | 81 | 55 | 46 | 81 | 386,400 |
| Canyon (FMR) | 99 | 81 | 76 | 105 | 385,600 |
| International Amistad (FIMPW) | 73 | 68 | 86 | 72 | 3,497,000 |
| International Falcon (FIMPW) | 39 | 33 | 77 | 38 | 2,668,000 |
| Livingston (IMW) | 106 | 101 | 85 | 95 | 1,788,000 |
| Possum Kingdom (IMPRW) | 93 | 84 | 98 | 95 | 570,200 |
| Red Bluff (FI) | 22 | 29 | 27 | 21 | 307,000 |
| Toledo Bend (P) | 92 | 88 | 80 | 83 | 4,472,000 |
| Twin Buttes (FIM) | 12 | 9 | 30 | 11 | 177,800 |
| Lake Kemp (IMW) | 93 | 70 | 86 | 93 | 268,000 |
| Lake Meredith (FWM) | 30 | 35 | 38 | 31 | 796,900 |
| Lake Travis (FIMPRW) | 88 | 58 | 77 | 86 | 1,144,000 |
| **MONTANA** | | | | | |
| Canyon Ferry (FIMPR) | 79 | 80 | 89 | 83 | 2,043,000 |
| Fort Peck (FPR) | 75 | 88 | 85 | 75 | 18,910,000 |
| Hungry Horse (FIPR) | 82 | 84 | 84 | 77 | 3,451,000 |
| **WASHINGTON** | | | | | |
| Ross (PR) | 82 | 82 | 79 | 89 | 1,052,000 |
| Franklin D. Roosevelt Lake (IP) | 84 | 94 | 100 | 94 | 5,022,000 |
| Lake Chelan (PR) | 73 | 67 | 65 | 81 | 676,100 |
| Lake Cushman (PR) | 53 | 55 | 83 | 74 | 359,500 |
| Lake Merwin (P) | 92 | 92 | 91 | 99 | 245,600 |
| **IDAHO** | | | | | |
| Boise River (4 reservoirs) (FIP) | 53 | 53 | 54 | 49 | 1,235,000 |
| Coeur d'Alene Lake (P) | 55 | 60 | 54 | 66 | 238,500 |
| Pend Oreille Lake (FP) | 43 | 34 | 49 | 61 | 1,561,000 |
| **IDAHO–WYOMING** | | | | | |
| Upper Snake River (8 reservoirs) (MP) | 51 | 69 | 57 | 45 | 4,401,000 |
| **WYOMING** | | | | | |
| Boysen (FIP) | 77 | 88 | 80 | 78 | 802,000 |
| Buffalo Bill (IP) | 62 | 79 | 71 | 59 | 421,300 |
| Keyhole (F) | 29 | 41 | 43 | 29 | 193,800 |
| Pathfinder, Seminoe, Alcova, Kortes, Glendo, and Guernsey Reservoirs (I) | 59 | 71 | 48 | 57 | 3,056,000 |
| **COLORADO** | | | | | |
| John Martin (FIR) | 79 | 63 | 13 | 77 | 364,400 |
| Taylor Park (IR) | 64 | 66 | 54 | 66 | 106,200 |
| Colorado–Big Thompson project (I) | 74 | 85 | 56 | 54 | 730,300 |
| **COLORADO RIVER STORAGE PROJECT** | | | | | |
| Lake Powell; Flaming Gorge, Fontenelle, Navajo, and Blue Mesa Reservoirs (IFPR) | 89 | 93 | 69 | 90 | 31,620,000 |
| **UTAH–IDAHO** | | | | | |
| Bear Lake (IPR) | 77 | 82 | 59 | 78 | 1,421,000 |
| **CALIFORNIA** | | | | | |
| Folsom (FIP) | 50 | 61 | 52 | 52 | 1,000,000 |
| Hetch Hetchy (MP) | 51 | 57 | 42 | 55 | 360,400 |
| Isabella (FIR) | 33 | 44 | 24 | 34 | 568,100 |
| Pine Flat (FI) | 29 | 55 | 42 | 26 | 1,001,000 |
| Clair Engle Lake (Lewiston) (P) | 64 | 79 | 71 | 67 | 2,438,000 |
| Lake Almanor (P) | 59 | 87 | 50 | 58 | 1,036,000 |
| Lake Berryessa (FIMW) | 74 | 84 | 75 | 74 | 1,600,000 |
| Millerton Lake (FI) | 46 | 34 | 41 | 36 | 503,200 |
| Shasta Lake (FIPR) | 49 | 73 | 65 | 48 | 4,377,000 |
| **CALIFORNIA–NEVADA** | | | | | |
| Lake Tahoe (IPR) | 55 | 76 | 47 | 56 | 744,600 |
| **NEVADA** | | | | | |
| Rye Patch (I) | 56 | 94 | 58 | 55 | 194,300 |
| **ARIZONA–NEVADA** | | | | | |
| Lake Mead and Lake Mohave (FIMP) | 92 | 92 | 70 | 93 | 27,970,000 |
| **ARIZONA** | | | | | |
| San Carlos (IP) | 84 | 72 | 19 | 83 | 935,100 |
| Salt and Verde River system (IMPR) | 82 | 76 | 38 | 80 | 2,019,100 |
| **NEW MEXICO** | | | | | |
| Conchas (FIR) | 85 | 61 | 79 | 85 | 330,100 |
| Elephant Butte and Caballo (FIPR) | 87 | 64 | 29 | 86 | 2,453,000 |

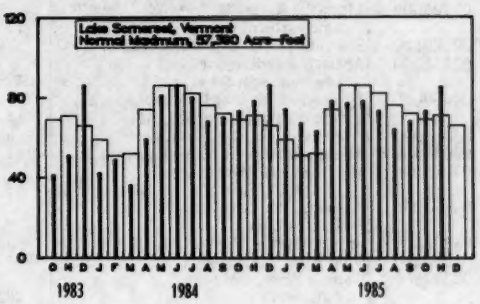
[a]1 acre-foot = 0.0436 million cubic feet = 0.326 million gallons = 0.504 cubic feet per second day.
[b]Thousands of kilowatt-hours (the potential electric power that could be generated by the volume of water in storage).

## USABLE CONTENTS OF SELECTED RESERVOIRS AND RESERVOIR SYSTEMS, OCTOBER 1983 TO NOVEMBER 1985

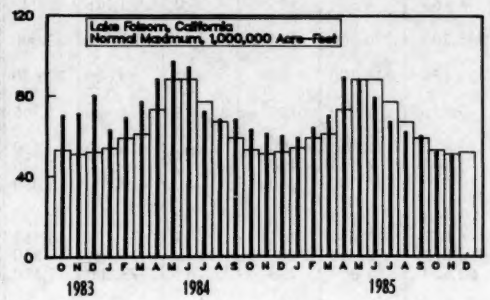


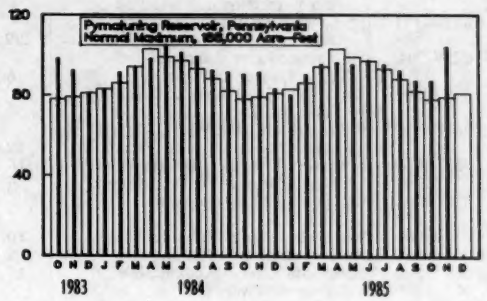



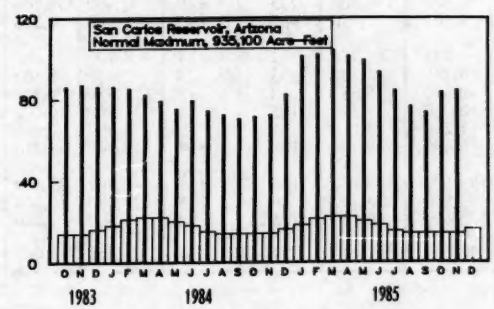



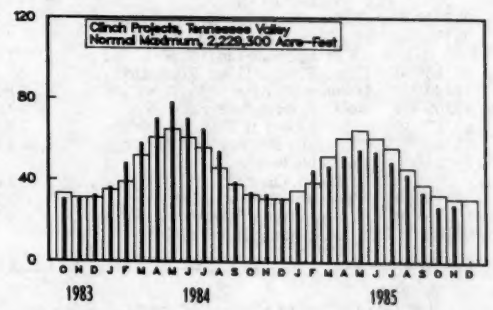




PERCENT OF NORMAL MAXIMUM





Pymatuning Reservoir, Pennsylvania
Normal Maximum, 186,000 Acre-Feet
120
80
40
0
O N D J F M A M J J A S O N D J F M A M J J A S O N D
1983
1984
1985





Clinch Projects, Tennessee Valley
Normal Maximum, 2,229,300 Acre-Feet
120
80
40
0
O N D J F M A M J J A S O N D J F M A M J J A S O N D
1983
1984
1985

Provisional data; subject to revision

## FLOW OF LARGE RIVERS DURING NOVEMBER 1985

| Station number | Stream and place of determination | Drainage area (square miles) | Mean annual discharge through September 1980 (cubic feet per second) | November 1985 | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | Monthly mean discharge (cubic feet per second) | Percent of median monthly discharge, 1951–80 | Change in discharge from previous month (percent) | Discharge near end of month | | |
| | | | | | | | Cubic feet per second | Million gallons per day | Date |
| 01014000 | St. John River below Fish River at Fort Kent, Maine | 5,690 | 9,647 | 5,498 | 78 | +22 | 3,300 | 2,130 | 30 |
| 01318500 | Hudson River at Hadley, N.Y | 1,664 | 2,909 | 4,790 | 199 | +65 | 3,540 | 2,287 | 30 |
| 01357500 | Mohawk River at Cohoes, N.Y | 3,456 | 5,734 | 6,390 | 134 | +128 | 8,180 | 5,286 | 30 |
| 01463500 | Delaware River at Trenton, N.J | 6,780 | 11,750 | 17,570 | 179 | +82 | 35,600 | 23,010 | 30 |
| 01570500 | Susquehanna River at Harrisburg, Pa | 24,100 | 34,530 | 42,500 | 172 | +263 | 131,000 | 84,700 | 30 |
| 01646500 | Potomac River near Washington, D.C. | 11,560 | [1]11,490 | 42,670 | 959 | +972 | 52,400 | 33,870 | 30 |
| 02105500 | Cape Fear River at William O. Huske Lock near Tarheel, N.C. | 4,810 | 5,005 | 8,320 | 426 | +470 | 19,940 | 12,887 | 29 |
| 02131000 | Pee Dee River at Peedee, S.C | 8,830 | 9,851 | 11,040 | 244 | +166 | 26,300 | 17,000 | 26 |
| 02226000 | Altamaha River at Doctortown, Ga | 13,600 | 13,880 | 12,260 | 245 | +169 | 31,400 | 20,290 | 30 |
| 02320500 | Suwannee River at Branford, Fla | 7,880 | 6,987 | 4,810 | 144 | –3 | 4,460 | 2,882 | 26 |
| 02358000 | Apalachicola River at Chattahoochee, Fla | 17,200 | 22,570 | 10,300 | 92 | +6 | 13,300 | 8,600 | 26 |
| 02467000 | Tombigbee River at Demopolis lock and dam near Coatopa, Ala | 15,400 | 23,300 | 10,940 | 173 | -26 | 18,600 | 12,020 | 30 |
| 02489500 | Pearl River near Bogalusa, La | 6,630 | 9,768 | 10,841 | 423 | +101 | 4,380 | 2,830 | 30 |
| 03049500 | Allegheny River at Natrona, Pa | 11,410 | [1]19,480 | 44,600 | 326 | +624 | 65,700 | 42,460 | 30 |
| 03085000 | Monongahela River at Braddock, Pa. | 7,337 | [1]12,510 | 37,100 | 480 | +675 | 104,000 | 67,200 | 30 |
| 03193000 | Kanawha River at Kanawha Falls, W. Va | 8,367 | 12,590 | 22,200 | 281 | +625 | 16,700 | 10,790 | 25 |
| 03234500 | Scioto River at Higby, Ohio | 5,131 | 4,547 | 13,510 | 832 | +1,489 | 34,000 | 22,000 | 29 |
| 03294500 | Ohio River at Louisville, Ky[2] | 91,170 | 116,000 | 205,500 | 329 | +549 | 170,500 | 110,200 | 24 |
| 03377500 | Wabash River at Mount Carmel, Ill | 28,635 | 27,220 | 61,470 | 556 | +578 | 136,100 | 87,960 | 30 |
| 03469000 | French Broad River below Douglas Dam, Tenn | 4,543 | 6,798 | 6,088 | 130 | +254 | ..... | ..... | ... |
| 04084500 | Fox River at Rapide Croche Dam, near Wrightstown, Wis[2] | 6,150 | 4,163 | 4,384 | 125 | 0 | 3,146 | 2,033 | 30 |
| 04264331 | St. Lawrence River at Cornwall, Ontario–near Massena, N.Y[3] | 299,000 | 242,700 | 286,500 | 115 | –1 | 269,000 | 173,900 | 2 |
| 02NG001 | St. Maurice River at Grand Mere, Quebec | 16,300 | 25,150 | 14,300 | 79 | –24 | 19,600 | 12,670 | 30 |
| 05082500 | Red River of the North at Grand Forks, N. Dak | 30,100 | 2,551 | 2,410 | 190 | –39 | 1,960 | 1,266 | 29 |
| 05133500 | Rainy River at Manitou Rapids, Minn. | 19,400 | 12,830 | 18,500 | 190 | –42 | 16,000 | 10,300 | 22 |
| 05330000 | Minnesota River near Jordan, Minn | 16,200 | 3,402 | 4,313 | 480 | –52 | 3,600 | 2,330 | 30 |
| 05331000 | Mississippi River at St. Paul, Minn | 36,800 | [1]10,610 | 15,081 | 240 | –47 | 9,400 | 6,080 | 30 |
| 05365500 | Chippewa River at Chippewa Falls, Wis | 5,600 | 5,100 | 7,413 | 192 | –55 | 5,860 | 3,787 | 30 |
| 05407000 | Wisconsin River at Muscoda, Wis | 10,300 | 8,617 | 17,214 | 262 | –4 | 13,520 | 8,738 | 27 |
| 05446500 | Rock River near Joslin, Ill | 9,551 | 5,873 | 16,700 | 441 | +151 | 13,700 | 8,850 | 30 |
| 05474500 | Mississippi River at Keokuk, Iowa | 119,000 | 62,620 | 101,000 | 220 | –11 | 73,200 | 47,310 | 30 |
| 06214500 | Yellowstone River at Billings, Mont | 11,796 | 7,038 | 3,389 | 88 | –19 | 2,500 | 1,620 | 30 |
| 06934500 | Missouri River at Hermann, Mo | 524,200 | 79,490 | 151,800 | 278 | +3 | 150,000 | 97,000 | 29 |
| 07289000 | Mississippi River at Vicksburg, Miss[4] | 1,140,500 | 576,600 | 754,800 | 235 | +79 | 1,143,000 | 738,700 | 29 |
| 07331000 | Washita River near Dickson, Okla | 7,202 | 1,368 | 1,750 | 449 | –49 | 2,140 | 1,383 | 18 |
| 08276500 | Rio Grande below Taos Junction Bridge, near Taos, N. Mex | 9,730 | 725 | 953 | 227 | +74 | 700 | 450 | 27 |
| 09315000 | Green River at Green River, Utah | 40,600 | 6,298 | 3,702 | 133 | –14 | 2,480 | 1,602 | 22 |
| 11425500 | Sacramento River at Verona, Calif | 21,257 | 18,820 | 8,082 | 62 | +2 | 7,950 | 5,138 | 22 |
| 13269000 | Snake River at Weiser, Idaho | 69,200 | 18,050 | 15,500 | 103 | –4 | 16,400 | 10,600 | 30 |
| 13317000 | Salmon River at White Bird, Idaho | 13,550 | 11,250 | 5,110 | 99 | –5 | 4,590 | 2,966 | 28 |
| 13342500 | Clearwater River at Spalding, Idaho | 9,570 | 15,480 | 9,090 | 180 | +44 | 12,240 | 7,910 | 28 |
| 14105700 | Columbia River at The Dalles, Oreg[1,5] | 237,000 | 193,100 | 109,700 | 126 | +14 | 143,900 | 93,010 | 26 |
| 14191000 | Willamette River at Salem, Oreg. | 7,280 | 23,510 | 23,100 | 86 | +135 | 25,200 | 16,290 | 26 |
| 15515500 | Tanana River at Nenana, Alaska | 25,600 | 23,460 | 10,400 | 125 | –58 | 7,500 | 4,850 | 30 |
| 08MF005 | Fraser River at Hope, British Columbia | 83,800 | 96,290 | 45,200 | 77 | –36 | 24,500 | 15,800 | 20 |

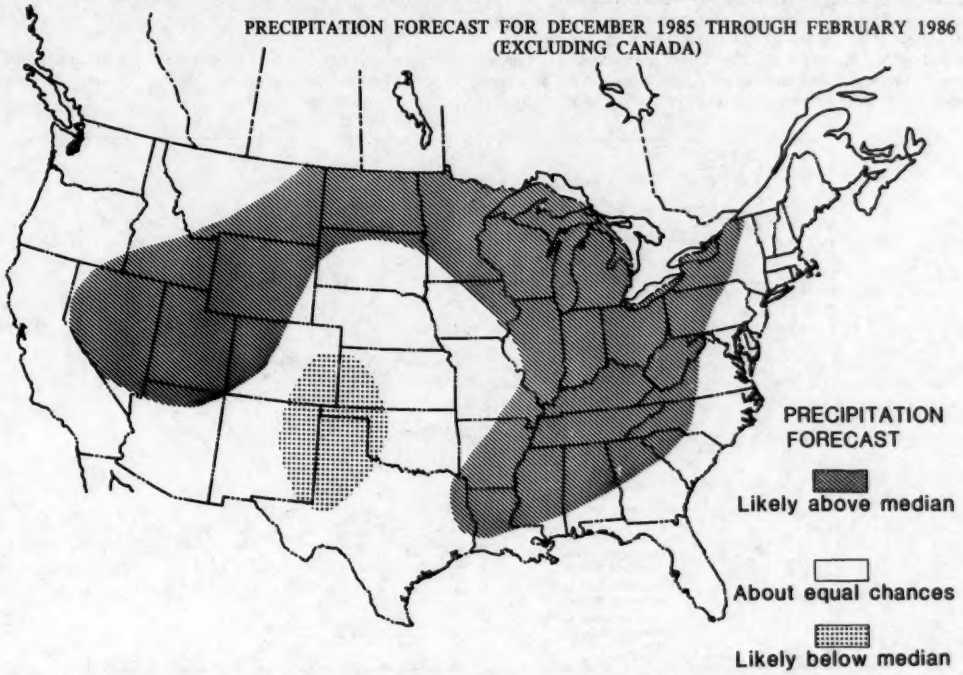
[1] Adjusted.
[2] Records furnished by Corps of Engineers.
[3] Records furnished by Buffalo District, Corps of Engineers, through International St. Lawrence River Board of Control. Discharges shown are considered to be the same as discharge at Ogdensburg, N.Y. when adjusted for storage in Lake St. Lawrence.
[4] Records of daily discharge computed jointly by Corps of Engineers and Geological Survey.
[5] Discharge determined from information furnished by Bureau of Reclamation, Corps of Engineers, and Geological Survey.

## DISSOLVED SOLIDS AND WATER TEMPERATURES, NOVEMBER 1985, AT DOWNSTREAM SITES ON SIX LARGE RIVERS

| Station number | Station name | November data of following calendar years | Stream discharge during month, Mean (cfs) | Dissolved-solids concentration[a], Minimum (mg/L) | Dissolved-solids concentration[a], Maximum (mg/L) | Dissolved-solids discharge[a], Mean (tons per day) | Dissolved-solids discharge[a], Minimum (tons per day) | Dissolved-solids discharge[a], Maximum (tons per day) | Water temperature[b], Mean, in °C | Water temperature[b], Minimum, in °C | Water temperature[b], Maximum, in °C |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 01463500 | Delaware River at Trenton, N.J. (Morrisville, Pa.) | 1985 | 17,565 | 72 | 105 | 4,000 | 1,500 | 9,620 | 9.5 | 5.5 | 12.0 |
| | | 1944–84 | 9,800 | 55 | 151 | ..... | 469 | 12,300 | ... | 2.0 | 19.0 |
| | | (Extreme yr) | | (1955) | (1964) | | (1963) | (1972) | | | |
| | | | [c]9,825 | | | | | | | | |
| 04264331 | St. Lawrence River at Cornwall, Ontario, near Massena, N.Y. (median streamflow at Ogdensburg, N.Y.) | 1985 | 286,500 | 164 | 166 | 127,600 | 119,700 | 131,400 | 9.5 | 7.0 | 12.5 |
| | | 1975–84 | 279,600 | 162 | 169 | 125,600 | 106,000 | 137,000 | 9.0 | 4.5 | 13.5 |
| | | (Extreme yr) | | (1980) | (1977) | | (1978) | (1977) | | | |
| | | | [c]248,300 | | | | | | | | |
| 07289000 | Mississippi River at Vicksburg, Miss. | 1985 | 754,800 | 192 | 288 | 492,900 | 351,700 | 677,800 | 14.0 | 9.5 | 17.0 |
| | | 1975–84 | 428,900 | 181 | 305 | 274,600 | 123,000 | 463,000 | 13.5 | 8.0 | 20.0 |
| | | (Extreme yr) | | (1984) | (1983) | | (1976) | (1984) | | | |
| | | | [c]320,600 | | | | | | | | |
| 03612500 | Ohio River at lock and dam 53, near Grand Chain, Ill. (streamflow station at Metropolis, Ill.) | 1985 | 462,000 | 149 | 237 | ..... | 94,900 | 294,000 | ... | 11.5 | 17.0 |
| | | 1954–84 | 172,600 | 129 | 425 | ..... | 27,200 | 406,000 | ... | 1.0 | 19.5 |
| | | (Extreme yr) | | (1957) | (1968) | | (1954) | (1957) | | | |
| | | | [c]147,600 | | | | | | | | |
| 06934500 | Missouri River at Hermann, Mo. (60 miles west of St. Louis, Mo.) | 1985 | 151,800 | 204 | 452 | 124,000 | 78,700 | 246,000 | 9.0 | 5.0 | 13.5 |
| | | 1975–84 | 81,170 | 225 | 506 | 85,040 | 43,600 | 185,000 | 9.5 | 3.5 | 15.0 |
| | | (Extreme yr) | | (1977) | (1980) | | (1976) | (1984) | | | |
| | | | [c]54,680 | | | | | | | | |
| 14128910 | Columbia River at Warrendale, Oreg. (streamflow station at The Dalles, Oreg.) | 1985 | 155,000 | 103 | 113 | 45,800 | 27,100 | 60,300 | 8.5 | 3.0 | 12.5 |
| | | 1975–84 | 131,500 | 38 | 128 | 36,500 | 10,800 | 66,400 | 11.5 | 6.0 | 14.5 |
| | | (Extreme yr) | | (1980) | (1978) | | (1980) | (1978) | | | |
| | | | [c]87,960 | | | | | | | | |

[a]Dissolved-solids concentrations, when not analyzed directly, are calculated on basis of measurements of specific conductance.
[b]To convert °C to °F: [(1.8 X °C) + 32] = °F.
[c]Median of monthly values for 30-year reference period, water years 1951–80, for comparison with data for current month.

PRECIPITATION FORECAST FOR DECEMBER 1985 THROUGH FEBRUARY 1986
(EXCLUDING CANADA)




(From Monthly and Seasonal Weather Outlook Published by National Weather Service)

# EVALUATION OF ENVIRONMENTAL FACTORS AFFECTING YIELDS OF MAJOR DISSOLVED IONS OF STREAMS IN THE UNITED STATES

The abstract and figures below are from the report, *Evaluation of environmental factors affecting yields of major dissolved ions of streams in the United States*, by Norman E. Peters, U.S. Geological Survey Water-Supply Paper 2228, 39 pages, 1984. This report may be purchased for $2.25 from Eastern Distribution Branch, Text Products Section. U.S. Geological Survey, 604 S. Pickett St., Alexandria, VA 22304 (check or money order payable to U.S. Geological Survey); or from Superintendent of Documents, Government Printing Office, Washington, D.C. 20402 (payable to Superintendent of Documents).

## ABSTRACT

The seven major dissolved ions in streams—sodium, potassium, magnesium, calcium, chloride, sulfate, and bicarbonate—and their sum dissolved solids from 56 basins in the conterminous United States and Hawaii were correlated with bedrock type, annual precipitation, population density, and average stream temperature of their respective basins through multiple-linear-regression equations to predict annual yields. The study was restricted to basins underlain by limestone, sandstone, or crystalline rock. Depending on the constituent, yields ranged from about 10 to 100,000 kilograms per square kilometer. Predicted yields were within 1 order of magnitude of measured yields.

The most important factor in yield prediction was annual precipitation, which accounted for 58 to 71 percent of all yields. Rock type was second in importance. Yields of magnesium, calcium, bicarbonate, and dissolved solids from limestone basins were 4 to 10 times larger than those from sandstone or crystalline basins as a result of carbonate weathering. Population density was an ineffective indicator of all constituents except sodium and chloride; it accounted for 13 percent of the annual sodium yield and 20 percent of the annual chloride yield. Average stream temperature was significant only for calcium and bicarbonate in limestone basins. Its relationship with yields was consistently negative. Either carbonate dissolution increases at low temperatures, or weathering in northern basins, which contain glacial deposits and have the lowest stream temperature, is greater than in southern basins.

Average ion contributions from atmospheric deposition accounted for 30 percent of the sodium and chloride and 60 percent of the sulfate in annual yields. The amount of sulfate derived from atmospheric contributions was higher in sandstone and crystalline basins (65 and 80 percent, respectively) than limestone basins (38 percent). This disparity is attributed to the lack of available sulfate in crystalline rock and the chemical precipitation of sulfate in the sandstone basins, most of which are in semi-arid or arid areas.

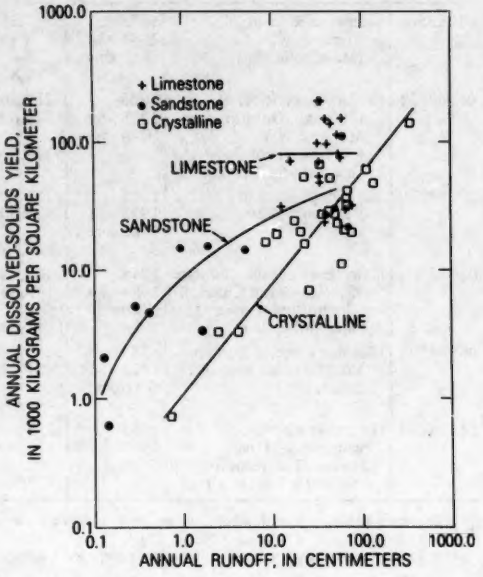



**Figure 2.** Annual dissolved-solids yield of streams in relation to annual runoff within drainage basins underlain by single bedrock types in the United States.

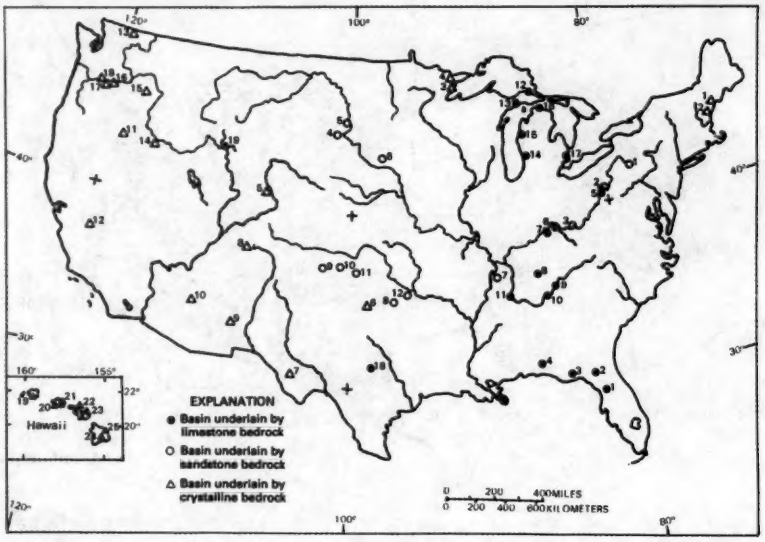
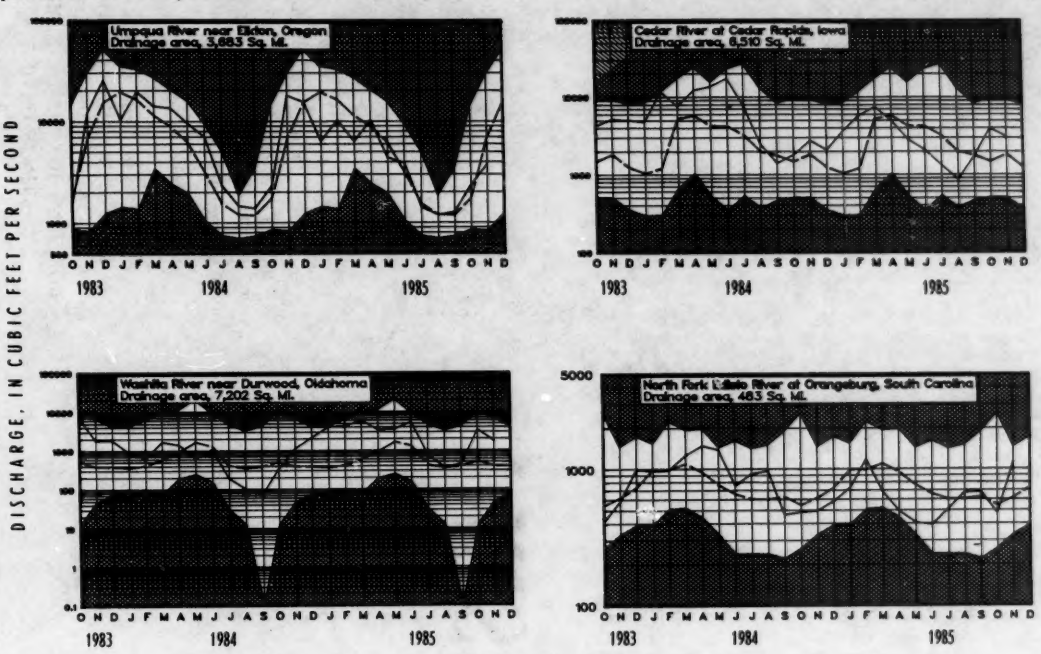

EXPLANATION
● Basin underlain by limestone bedrock
○ Basin underlain by sandstone bedrock
△ Basin underlain by crystalline bedrock
Hawaii
0 200 400 MILES
0 200 400 600 KILOMETERS

**Figure 1.** Locations of gaged stream sites for drainage basins underlain by single bedrock types.

## SURFACE WATER — MONTHLY MEAN DISCHARGE IN KEY STREAMS

Unshaded area indicates range between highest and lowest record for the month. Dashed line indicates median of monthly values for reference period, 1951—80. Heavy line indicates mean for current period.


DISCHARGE, IN CUBIC FEET PER SECOND
Umpqua River near Elkton, Oregon
Drainage area, 3,683 Sq. Mi.
Cedar River at Cedar Rapids, Iowa
Drainage area, 6,510 Sq. Mi.
Washita River near Durwood, Oklahoma
Drainage area, 7,202 Sq. Mi.
North Fork Edisto River at Orangeburg, South Carolina
Drainage area, 483 Sq. Mi.
5000
1000
100
O N D J F M A M J J A S O N D J F M A M J J A S O N D
1983
1984
1985

## NATIONAL WATER CONDITIONS

**November 1985**

Based on reports from the Canadian and U.S. Field offices; completed December 20, 1985


**TECHNICAL STAFF**

Thomas G. Ross, Editor
Carroll W. Saboe
Allen Sinnott
John C. Kammerer
Krishnaveni V. Sarma
Sharon A. Edmonds
Carole J. Marlow

**COPY PREPARATION**

Lois C. Fleshmon
Sharon L. Peterson
Aisha P.R. Law

**GRAPHICS**

Frances B. Davison
Carolyn L. Moss

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### EXPLANATION OF DATA

*Cover map* shows generalized pattern of streamflow for the month based on 18 index stream-gaging stations in Canada and 164 index stations in the United States. Alaska and Hawaii inset maps show streamflow only at the index gaging stations that are located near the point shown by the arrows.

Streamflow for the current month is compared with the flow for the same month in the 30-year reference period, 1951–80. Streamflow is considered to be *below the normal range* if it is within the range of the low flows that have occurred 25 percent of the time (below the lower quartile) during the reference period. Flow is considered to be *above the normal range* if it is within the range of the high flows that have occurred 25 percent of the time (above the upper quartile). Shorter reference periods are used for the Puerto Rico index stations because of the limited records available.

Flow higher than the lower quartile but lower than the upper quartile is described as being *within the normal range*. In the National Water Conditions, the median is obtained by ranking the 30 flows of each monthly of the reference period in their order of magnitude; the highest flow is number 1, the lowest flow is number 30, and the average of the 15th and 16th highest flows is the median. One-half of the time you would expect the flows for the month to be below the median and one-half of the time to be above the median.

Flood frequency analyses define the relation of flood peak magnitude to probability of occurrence or recurrence interval. Probability of occurrence is the chance that a given flood magnitude will be exceeded in any one year. Recurrence interval is the reciprocal of probability of occurrence and is the *average* number of years between occurrences. For example, a flood having a probability of occurrence of 0.01 (1 percent) has a recurrence interval of 100 years. Recurrence intervals imply no regularity of occurrence; a 100-year flood might be exceeded in consecutive years or it might not be exceeded in a 100-year period.

Statements about *ground-water levels* refer to conditions near the end of the month. The water level in each key observation well is compared with average level for the end of the month determined from the entire past record for that well or from a 30-year reference period, 1951–80. *Changes in ground-water levels*, unless described otherwise, are from the end of the previous month to the end of the current month.

Dissolved solids and temperature data for November are given for six stream-sampling sites that are part of the National Stream Quality Accounting Network (NASQAN). Dissolved solids are minerals dissolved in water and usually consist predominantly of silica and ions of calcium, magnesium, sodium, potassium, carbonate, bicarbonate, sulfate, chloride, and nitrate. Dissolved-solids discharge represents the total daily amount of dissolved minerals carried by the stream. Dissolved-solids *concentrations* are generally higher during periods of low streamflow, but the highest dissolved-solids *discharges* occur during periods of high streamflow because the total quantities of water, and therefore total load of dissolved minerals, are so much greater than at time of low flow.

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